



Workshop

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Dual-use Chemicals

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Chemical dual-use awareness

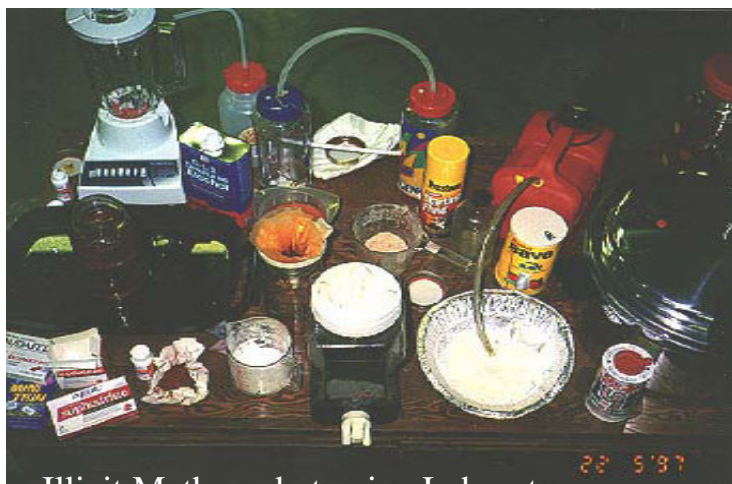
Dual use chemicals: Chemicals used in industry or everyday life that can also be used in bad ways.





Dual-use chemical example: Pseudoephedrine

- Pseudoephedrine is a common ingredient in cold medicines
- Precursor to crystal methamphetamine
- Recipes for conversion available on web



US DEA, http://www.deadiversion.usdoj.gov/pubs/brochures/pseudo/pseudo_trifold.htm, viewed Dec 2007



- Clandestine meth labs in US during 2002
 - Caused 194 fires, 117 explosions, and 22 deaths
 - Cost \$23.8 million for cleanup
 - Dumped chemicals led to
 - deaths of livestock
 - contaminated streams
 - large areas of dead trees and vegetation



Dual-use chemical example: Cyanide



Therence Koh/AFP/Getty Images



- Widely used in mining and metal plating industries, but is also a well known poison.
- Product tampering*
 - Tylenol capsules
 - laced with KCN
 - 7 deaths, fall 1982, Chicago, Illinois, USA
 - Led to tamper-proof product packaging
- Popular with criminals and terrorists because it is relatively easy to obtain
- HCN is CW agent AC



Dual-use chemical example: Pesticides

- Widely used in homes and agriculture, but also used to poison people.

FIGURE. Package of Chinese rodenticide implicated in the poisoning of a female infant aged 15 months — New York City, 2002



Photo/New York City Poison Control Center

- Dushuqiang (Strong Rat Poison)
 - Outlawed in China in the mid-1980s, but was still available
 - Nanjing, China, Sept. 2002
 - 38 people killed by poison in snack-shop food, >300 sick
 - Jealously by rival shop owner
 - Hunan, China, Sept. 2003
 - 241 people poisoned by cakes served by school cafeteria
 - Motive and perpetrator unknown
 - Tongchuan City, Shaanxi, China, April 2004
 - 74 people poisoned by scallion pancakes
 - Motive and perpetrator unknown
 - 5 other incidents reported between 1991 and 2004

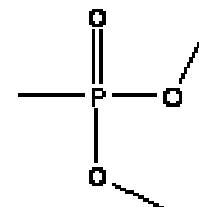
Ann. Emerg. Med., Vol. 45, pg. 609, June 2005



Many lab/industrial chemicals have dual uses

- **Dimethyl methyl phosphonate (DMMP)**

- Flame retardant for:
 - building materials, furnishings, transportation equipment, electrical industry, upholstery
- Nerve agent precursor



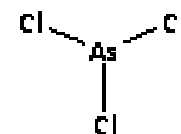
- **Thiodiglycol**

- Dye carrier, ink solvent, lubricant, cosmetics, anti-arthritic drugs, plastics, stabilizers, antioxidants, photographic, copying, antistatic agent, epoxides, coatings, metal plating
- Mustard gas precursor



- **Arsenic Trichloride**

- Catalyst in CFC manufacture, semiconductor precursor, intermediate for pharmaceuticals, insecticides
- Lewisite precursor

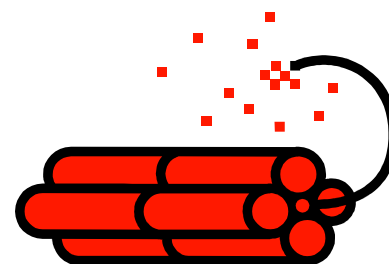


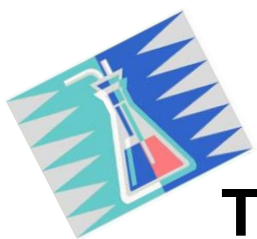
From: Chemical Weapons Convention: Implementation Assistance Programme Manual (on CD)



Dual-use Chemicals: Explosives

- **Theft of conventional explosives**
 - Chemical suppliers
 - Users such as mines or construction sites
- **Diversion of industrial or laboratory chemicals**
 - Chemical suppliers
 - Chemical factories
 - Academic teaching or research laboratories
 - Disposal sites





Theft / manufacture of explosives: Fertilizer Bomb



Photo: US DOD

- Ammonium nitrate fertilizer and fuel oil (diesel, kerosene)
- Used to bomb Alfred P. Murrah building in Oklahoma City, OK, USA
 - with nitromethane and commercial explosives
 - 168 dead, including children
 - April 1995
- Favored by IRA, FARC, ETA, etc.



Diversion of industrial / laboratory chemicals: Sodium azide



- **Widely available from older automobile airbags**
 - 1980s to 1990s
- **Poisonous**
- **Reacts explosively with metals**
 - Biological laboratory drains have exploded from discarded waste solutions containing NaN_3 as a preservative.
- **Has been found in possession of terrorists**



Diversion of industrial / laboratory chemicals

- Malaysian police arrested 36-year-old Alias Osman on June 9, 2003 in a Kuala Lumpur suburb. They claim he was a member of the militant Islamic group Jemaah Islamiah (JI). Police say he led them to an oil-palm plantation where a cache of chemicals was buried, including an unspecified amount of sodium azide. Most of the chemicals seized, potassium chloride*, calcium chloride* and aluminum powder, were similar to those used in the Bali bomb blasts.**

* Should be chlorate, not chloride

** Different devices may have used different explosive mixtures. Analysis gave evidence for chlorate and TNT

Simon Elegant, "Poisonous Minds," Time (Asia) 161, June 30, 2003.

<http://www.time.com/time/magazine/article/0,9171,501030630-460248,00.html>, viewed Nov. 2007

D. Royds, S.W. Lewis, A.M. Taylor, Talanta 67 (2005) 262–268



Diversion of industrial / laboratory chemicals: Quote from the “Terrorists Handbook”

2.1 ACQUIRING CHEMICALS

The first section deals with getting chemicals legally. This section deals with "procuring" them. The best place to steal chemicals is a college. Many state schools have all of their chemicals out on the shelves in the labs, and more in their chemical stockrooms. Evening is the best time to enter lab buildings, as there are the least number of people in the buildings, and most of the labs will still be unlocked. One simply takes a bookbag, wears a dress shirt and jeans, and tries to resemble a college freshman. If anyone asks what such a person is doing, the thief can simply say that he is looking for the polymer chemistry lab, or some other chemistry-related department other than the one they are in.

9.0 CHECKLIST FOR RAIDS ON LABS

http://www.totse.com/en/bad_ideas/irresponsible_activities/168593.html, downloaded Nov. 2007



Components of Chemical Security and Relationships Between Chemical Safety and Security

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Chemical Security

- **Is your Department secure?**
- **How easy would it be for someone to steal chemicals?**
- **Are your chemistry stockrooms, classrooms and research labs always locked and secure?**
- **Is someone always there when these rooms are open?**
- **Do you check your orders when chemicals arrive to be sure some chemicals are not missing?**





Components of Chemical Security

- Physical security of site
- Personnel management
- Information security
- Management of chemical security activities
- Allocation of chemical security responsibilities
- Development of emergency plans
- Chemical security training



Goal: Ensure that you don't accidentally help a criminal or a terrorist get dangerous chemicals



Chemical Security: Physical Site

LOCK UP!!



Controlled drugs

Chemical Surety Agents

Highly toxic chemicals





Chemical Security: Personnel Management

- Guard against both Insider and Outsider threat
- Does anyone check on people entering the building?
- Who has keys? How do they get authorized?
 - Building
 - Stockroom
 - Individual Labs
- When someone leaves, do you make sure they turn in keys?
- Don't want people making duplicate keys





Chemical Security: Information security

- **How do you track chemical inventory?**
 - Is the information secured so unauthorized people can't read it or alter it?
- **Would you know if:**
 - some toxic chemicals disappeared overnight?
 - some toxic chemicals didn't arrive?
 - someone was ordering chemicals in the name of your institution but diverting them?

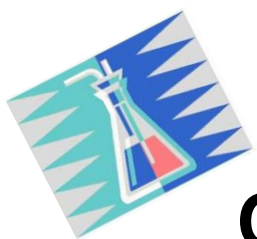




Chemical Security: Assign Responsibilities

- **Identify people who will be responsible for various chemical security activities**
 - Physical security and building modifications
 - Chemical tracking and reporting
 - Personnel and access management
 - Information management
 - Emergency planning
- **Ensure that they have the time and resources to do the job**
- **Integrate with chemical safety responsibilities**





Chemical Security: Professional behavior

- A Chemical Professional needs to use their scientific knowledge in a responsible manner



- A Chemical Educator needs to train their students to use their scientific knowledge in a responsible manner



Relationships between chemical safety and security

- **Chemical safety:** Protect against accidents
- **Chemical security:** Protect against deliberate harm
- Many practices are the same for chemical safety and security
- But there are a few areas of conflict





Good practices for both chemical safety and security

- **Minimize use of hazardous chemicals**
 - Replace with less-hazardous chemicals, if possible
 - Reduce scale of experiments
- **Minimize supply of hazardous chemicals on hand**
- **Restrict access to hazardous chemicals**
 - Know what you have
 - Know how to store, handle and dispose of what you have
 - Know who has access to materials, knowledge and expertise
- **Plan what to do in an emergency**



Conflicts between chemical safety and security: Information Sharing

Science generally means sharing information widely, but this may not always be advisable

- **Safety**

- Label everything so people can recognize hazardous chemicals.
- Alert community and especially emergency responders to possible chemical dangers.
- Share knowledge about chemical hazards so people know to be alert.

- **Security**

- Labels help identify targets for theft or attack.
- Sharing locations of chemicals can publicize targets for theft or attack.
- Sharing knowledge of chemical hazards could inspire harmful behavior (copy-cat criminals).



Conflicts between chemical safety and security: Facility exits

- Locking exit doors is secure, but not safe.
 - For **safety**, we want people to be able to leave the facility quickly and by many routes.
 - For **security**, we want to control exits as well as entrances so chemicals (or equipment) don't get taken.





Setting priorities

- Labs need to be **safe**, **secure** and **productive**
 - Policies and practices need to be flexible enough to allow for the uncertainties of research.
 - Policies and practices need to align with local laws, regulations, practices and culture. Can't just copy policies from somewhere else.
- Use risk-based security and safety measures.
 - Can't afford to defend against every imaginable hazard.
 - Identify threats, characterize facilities, identify alternatives, analyze costs vs. performance
- Be alert for suspicious activities or inquiries



Summary

- **Chemical safety and security are important**
 - Academic chemistry laboratories are an attractive target for theft of chemicals
- **Chemical safety and security measures have a lot of overlap**
 - Attitudes and awareness
 - Policies
 - Physical additions/changes to buildings and labs





Workshop evaluation and feedback form

- Please help us improve this workshop by filling out and returning this form.





Thanks for coming!

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